THE MYCOPHILE

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Tickets for MO-NAMA 2022 LAST CHANCE

The Mycophile: Publication of the North American Mycological Association
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Address questions to Bruch Reed, mycophile@namyco.org.

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The Toadstool Picker's News

What brings you to NAMA?

by Trent Blizzard

Diversity has been a challenging topic for NAMA, one which we have long been looking to explore and improve upon. Whether we are talking about regional, racial, gender or socio-economic diversity, we can accurately say there is plenty room for improvement. One space NAMA does represent quite well is our community's diversity of mycological interests.

Whether your interest is taxonomy, cultivation, culinary, artistic, professional or medicinal we have a place for you: a committee to join, a webinar for you to attend, a session at our Annual Foray (now in its 60th year!) or an article for you to write for our *Mycophile* newsletter.

Our members, our programs and our organizational structure are fundamentally diverse.

Of course there are many other interests that we accommodate, too many to name them all here. In just the last 12 months, we agreed that psycho-active mushrooms should have a place and be discussed within our organization, after being considered taboo for decades. DNA sequencing appears to be an up-and-coming interest area in which we are actively working to formalize our participation.

Our diversity is very much a reflection of our membership, and tends to bubble up into our leadership structure. All of us had some primary interest that sparked our love of mycology. Most of us have that one area we really like to dive deep in, and many of our members are experts in more than one interest area.

The thing that sparked my passion for mycology was the thrill of the hunt and the culinary aspect. Over time, I have found myself gravitating towards the medicinal and ethnomycological realms and also trying to improve my taxonomy skills. Do you have a similar story? What sparked your interest? What areas of mycology thrill you?

Anyone can use Google, Facebook, or a book to advance their interests. But those inanimate digitized hings are no replacement for people. They do not come close to the satisfaction we get from rubbing elbows with fellow enthusiasts, developing relationships, contributing to a community and sharing our passions. Personally, I originally came to NAMA primarily to foray in new locales and learn from the experts.

I stayed in NAMA because of the people, the life-long friends I made and continue to make - the experts whom I learn from and the newbies with whose passions I get to help develop.

Ultimately, the giving becomes more valuable than the taking.

I think NAMA's story is one of people, not of mushrooms. Our passion brought us here but our relationships keep us here. NAMA should be a place that welcomes the diversity of interests that fall within the scientific and educational realm of mycology. Our mission statement says

"NAMA is committed and dedicated to the promotion of scientific and educational activities related to fungi."

Lets welcome everyone's interests, make a place for them in our organization, and foster those interests.

What does this welcoming look like? For me, it means respecting and encouraging other people's interests, even if I don't happy to share them. It means being a champion of diverse programming. It means creating space in the organization for people that want to try something new. On the negative side, it means not expecting others to share your interests or do your bidding. It means recognizing that we are all volunteers with our own interests, priorities and personal lives. It doesn't work to demand that NAMA further our own particular interest; instead, we must step up and volunteer our time to help elevate and expand those interests to others. Encourage others to join in, build relationships and make the organization more diverse. I can promise I will do my best to make a space for your interest in NAMA, a space where you can grow that interest and share with your fellow members.

So let's hear it! Share your interests with us, get involved, and inspire our whole community with your passion. We are actively looking for new Zoom webinar topics for this fall and winter. We welcome your *Mycophile* articles and would love to have your interest represented on our website too. Most importantly, let's recognize NAMA for what it is: an association of people who have a common interest where you get back much more than what you give to it.

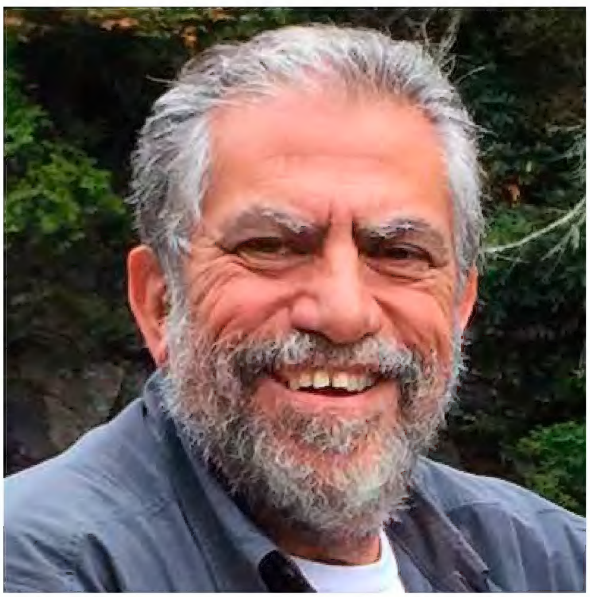
Mycology in the NEWS

MO-NAMA SUPERSTAR PRESENTERS

By Kathy Yerich

We've talked about location, we've talked about mushroom species, but we haven't shared the juicy details about the MO-NAMA 2022 lectures, workshops and demonstrations.
This year's stellar line-up is included here, in alphabetical order. There is so much to choose from and we haven't even shared the many half- and full-day foray options yet!
Choosing what lecture to attend is the hardest part; registering for the foray is the easiest! Use the link here: https://namyco.org/annual_foray.php

Presenter: Henry J. Beker
Lecture: *Species Identification Using Artificial Intelligence - The* Hebeloma *project from database to website*
Lecture: *The* Hebeloma *of Peck and Murrill – Some 150 North American Taxa Resolved*



Henry Beker lives in Brussels, Belgium and is a professor and Honorary Fellow at Royal Holloway, University of London. Originally a mathematician, he spent many years working in Informatics, building and growing companies worldwide. About 30 years ago he became fascinated by mycology. Following a chance meeting with Danish mycologist Jan Vesterholt in 2000, he became interested in the genus *Hebeloma*. Since 2005, his mycological research has been focused solely on *Hebeloma* and in 2016 (with Ursula Eberhardt), the monograph *Fungi Europaei 14* was published on Hebeloma in Europe. Henry has also served on the council of the British Mycological Society and is currently a Scientific Collaborator with Botanic Garden, Meise.

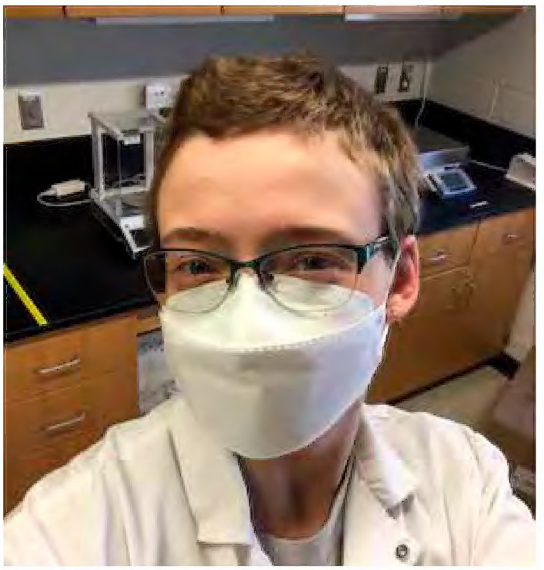
Presenter: Denis Benjamin
Workshop: *Watercolor Workshop 1*
Workshop: *Watercolor Workshop 2*

Denis Benjamin was born in South Africa and emigrated to the USA in 1970. He practiced pediatric pathology at the children's hospital in Seattle and later at Cook Children's in Fort Worth. He became a hiker and mushroom enthusiast, spending much of his leisure time on the eastern slopes of the Cascades. Now retired from medical practice, he devotes his energy to natural history and documenting his travels, flowers and mushrooms with photography and watercolors. The latter was inspired by a workshop with the noted Russian botanical artist Alexander Sasha Viazmensky. The delicate transparency and vibrancy of watercolors proved to be the ideal medium to capture the images of nature. He currently resides in Fort Worth, Texas and is a Research Associate at the Botanical Research Institute of Texas. He is a member of the Southwestern Watercolor Society (Dallas), the American Society of Botanical Artists and a Signature member of the Society of Watercolor Artists (Fort Worth).

Presenter: Cornelia Cho
Lecture: *Medicinal Mushrooms Part 1*
Lecture: *Medicinal Mushrooms Part 2*

Cornelia Cho, M.D. is a practicing board-certified pediatrician, Mushroom Club of Georgia president, citizen-scientist and artist. In addition to pediatric emergency room experience and a pharmacology fellowship, she has trained in Mind/Body & Brain science, drug-free therapies for treating trauma, and wilderness medicine preparedness. Her Korean heritage gave her a head start on a pro- and prebiotic-rich diet along with early experience collecting wild foods. She loves growing, preserving, fermenting, foraging, cooking and eating good food, as well as finding waste solutions, learning and teaching about regenerative agriculture, reclaiming traditional foodways and advocating for food justice. She has been a previous presenter at NAMA and to numerous mycological societies across the US. She gave a recent keynote at the Midwest Women's Herbal conferences, where she is also a regular featured presenter, as well as presenting regularly at Mycelium Mysteries and the Wild Health Summit. She has particularly enjoyed teaching at John C. Campbell Folk School alongside her husband of 23 years, NAMA Foray Committee Chair Sam Landes.

Presenter: Mara DeMers
Lecture: *A Brief History of Fungal Endophyte Research*
Lecture: *Habitat-scale Heterogeneity Maintains Fungal Endophyte Diversity in Two Native Prairie Legumes*



Mara DeMers received the 2019 NAMA Memorial Fellowship, administered by Mycological Society of America (MSA). Her first foray into mycology occurred in college, when she had the opportunity to study *Cortinarius* specimens housed in the University of Minnesota Bell Museum Herbarium with Dr. Dave McLaughlin for an honors project. She completed a BS at the University of Minnesota in 2014, then stayed to complete her PhD in 2021 studying endophytic fungi that make up the microbiomes of prairie plants with Dr. Georgiana May. Mara is currently a postdoctoral researcher in Dr. Christine Hawkes' lab at North Carolina State University, studying how fungal endophytes affect wheat yield.

Presenter: Natalie Howe
Workshop: *How You Lichen Me Now? (How Do You Figure Out Lichens and Why Should You Care?)*
Lecture: *Life, Death and Taxes: Lichen or Not.*

Natalie's gateway fungus was lichens. While on a field trip as part of the University of Pennsylvania's Master of Environmental Studies program, she found lichens on a superfund site in Pennsylvania and was hooked! To learn lichens, she volunteered at the Academy of Natural Sciences of Philadelphia, where she had the outstanding good fortune to be mentored by James C. Lendemer. Eventually she thought, if some people can be lichenologists, why not me?! She was accepted at Rutgers University's Graduate Program in Ecology and Evolution, where she studied soil-lichen ecology. Since graduating in 2016, she studies the urban lichens of Washington D.C. and the Patuxent Research Refuge in Maryland on the weekends. On weekdays, she works to prevent the spread of plant diseases at the USDA's Animal and Plant Health Inspection Service and in the springtime inspires people with appreciation for how intriguing and wonderful mushrooms are while teaching Mushrooms, Molds and Society at George Mason University. Since she has a one-year-old kiddo in her life, she is interested in introducing young people to forest adventures while encouraging them not to ingest too many arthropods, leaves or lichens!

Presenter & Chief Mycologist: Jay Justice
Lecture: *Please Show Me the Best Locations to Find Those Missouri Mushrooms?*
Lecture: *A Look at Some Interesting and Perhaps Unusual Mushrooms Found in Missouri!*

Jay Justice became enthralled with mushrooms and fungi while pursuing a graduate degree in Natural Sciences many years ago. After completing his graduate degree, Jay joined NAMA in 1980. In 1982, he was instrumental in forming the Arkansas Mycological Society and participated in his first NAMA foray in 1985. Within NAMA, Jay has served in many roles: Foray Committee Chair, editor of *The Mycophile* (NAMA's newsletter) and vice president for several years. In 2011, Jay received the Gary Lincoff Award for Contributions to Amateur Mycology, an award given each year by NAMA to recognize service performed by selected amateur or professional mycologists. He has been listed as a contributing author on several research papers in mycological journals and he is a co-author (with Dr. Britt A. Bunyard) on the recently published book, *Amanitas of North America.* He continues to serve as a scientific advisor for four mycological societies as well as an invited foray mycologist at ongoing mycological conferences.

Presenter: Chef Ryan Maher
Lecture: *Missouri's Offerings: a Demo and Tasting of Funga and Flora*
Culinary Workshop: *Missouri's Wild Edibles…YUM!*

After opening a couple of restaurants in St Louis, Ryan moved to New Orleans to work for a number of years for Emeril Lagasse at his flagship restaurant "Emeril's." Hurricane Katrina brought him back to the St. Louis area where he was chef at such restaurants as Monarch, Boundary, 360 and other high-end spots. Ryan's background as a chef and his love for the outdoors made the natural connection between foraging and cooking, culminating in him opening *Missouri's Wild Edibles, a* company that makes delicious products from foraged foods. As a caterer, almost all of his creations are from foraged foods. Recently he created an amazing dinner pairing of local bourbon with mostly foraged foods. Tantalizing featured recipes included puree of daylilies, fermented goat's milk, *Hericium*, purslane, lamb's quarters and sumac.

Presenter & Chief Mycologist: Andrew Methven
Lecture: *Toxicology Report: Can I Eat These Mushrooms?*
Keynote: *Women in North American Mycology*
Workshop: *Microscopy with Andy Miller*

Andrew Methven is emeritus professor of mycology and lichenology at Eastern Illinois University. He has taught courses in mycology, lichenology, medical mycology and field mycology, and curated the Cryptogamic Herbarium (with more than 15,000 collections of fungi and lichens). Included among his research interests are systematics and ecology of fungi, mycogeography, the application of molecular techniques to fungal systematics, and the identification and distribution of lichens in Eastern North America.

Presenter: Andy Miller
Lecture: *The Mycology Collections Portal - Not Just for Professionals*
Lecture: *Edible and Poisonous Mushrooms of the Midwest*
Workshop: *Microscopy with Andrew Methven*

Dr. Andrew Miller is a research professor and serves as the Director of the Herbarium/Fungarium at the Illinois Natural History Survey at the University of Illinois Urbana-Champaign.
A native of Illinois, Andy began his formal education in mycology under the tutelage of Dr. Andrew Methven at Eastern Illinois University and completed his doctoral degree at The Field Museum in Chicago, IL. Andrew has traveled extensively throughout the world collecting and describing fungi, documenting their biodiversity, and studying their evolutionary relationships. An expert on both large macrofungi and small microfungi, he has described over 100 species of fungi new to science. Dr. Miller has published over 160 scientific and popular papers on fungi and has given numerous lectures and workshops to a variety of organizations on the diversity and importance of fungi.

Presenter and Foray Leader: Mike Snyder
Lecture: *Intro to Outdoor Mushroom Cultivation*
Workshop: *Shiitake Log Inoculation*
Workshop: *Beginner's Oyster Mushroom Workshop*

Mike discovered the world of fungi almost fifteen years ago and has been studying and hunting mushrooms in the Missouri Ozarks ever since. The past few years his interest turned to the world of mushroom cultivation and he has been successfully growing shiitakes, oysters, wine caps and *Hericium* species outdoors ever since. He and his wife Cara are homesteaders and own a small mushroom and herb farm, WildWise Botanicals. They sell fresh and dried mushrooms along with a wide variety of value-added products made from both cultivated and wild-harvested mushrooms and plants. Mike loves nothing more than to teach others about the mycoflora of the region and how to successfully grow mushrooms outdoors, so offering educational opportunities has also become a major focus of the business: always learning, always teaching!

Presenter: Jon Sommer
Lecture: *Key Features for the Field Identification of Mushrooms and Other Fleshy Fungi (followed by Beginners Foray)*

Jon Sommer received a bachelor's degree in botany from Humboldt State University and master's degrees in botany and plant pathology from the University of California, Davis. He has studied mushroom identification with notable mycologists including Drs. David Largent, Orson Miller, Harry D. Thiers, and Daniel Stuntz. He has led mushroom forays and taught classes on mushroom identification across the U.S. for more than 40 years. A member of the Colorado Mycological Society, Jon served as club president from 1993 to 2021.

Presenter: Rachel Swenie
Lecture: *Hedgehogs, Corals, and Crusts, Oh My! Fungal Diversity in the Order Cantharellales*
Lecture: *Which Chanterelle Is That?*

Rachel Swenie received the 2021 NAMA Memorial Fellowship, administered by Mycological Society of America (MSA). She is a PhD candidate in the Department of Ecology & Evolutionary Biology at the University of Tennessee, Knoxville. Her research focuses on species diversity and trait evolution among chanterelle mushrooms and their relatives. Rachel is a National Science Foundation Graduate Research Fellow and a passionate field mycologist who has worked extensively in the southern Appalachian mountains. Rachel leads guided fungi hikes for the Spring Wildflower Pilgrimage in the Great Smoky Mountains National Park and serves as the scientific advisor to the Cumberland Mycological Society of Tennessee.

DNA Sequencing for MO-NAMA 2022

By Stephen Russell
Hoosier Mushroom Society

NAMA forays provide a special and limited opportunity to document a significant amount of fungal biodiversity in a very short timeframe. These forays typically bring thousands of individual collections to a central location, where a subset is triaged and vouchered for permanent storage in an herbarium - often around 400 to 500 species. A similar number of species are identified by experts and placed on viewing tables. Having attended many past NAMA forays, it is always interesting to see the rare specimens that are encountered and put on display, but there are always a very large number of specimens that remain unidentified on the tables at these events. These specimens have always been of particular interest to me and it has been a dream to examine these abandoned specimens in more detail. Time and resources are the primary limiting factors for further documentation of these specimens. There are a limited number of identifiers working the tables, a limited number of people working microscopes and, even if someone spends the time and work to identify a difficult Russula or Entoloma, it is quite possible that the species is currently undescribed, so no amount of time and resources spent will attain an accurate identification. A secondary issue is that many, if not an outright majority of the names that are applied to vouchered specimens at these events (or any foray continent-wide), will not withstand the test of time. Every month, new research shows that the names that have been historically applied to North American collections should no longer be utilized. Two of the most common scenarios are that multiple cryptic species were going under a single scientific epithet or that European names have been inappropriately applied to similar North American species. The best methodology to give a species list a chance of withstanding the test of time and to give the collecting effort lasting scientific value is to retain dried specimens of the species that were encountered and to obtain DNA sequences or “barcodes” of these specimens.

Cost has always been a limiting factor when planning a biodiversity inventory for fungi based on DNA barcodes/sequencing. It is not uncommon for the process to cost $10to $20 per specimen,

which adds up quickly. However, there is now a path to drop that cost by an order of magnitude. Over the last month, I have been working with a sequencing technology that has recently matured enough to be useful for fungal barcoding: Oxford Nanopore Technologies (ONT) MinION and Flongle devices. These are small, portable, and relatively inexpensive DNA-sequencing devices that can be used efficiently in a personal laboratory space at home or out in the field while traveling to obtain low-cost DNA barcodes for fungi. Initial trials suggest that it will be possible to drop the cost per specimen to well below $1.00 each (including costs for extraction, amplification, and sequencing), making it feasible to examine the DNA for every individual collection that makes its way into the sorting room and to have all the results within 24 hours of the end of the event.

This is what we intend to attempt at the MO-NAMA 2022 Annual Foray, this year at Trout Lodge in Potosi, Missouri. We will be looking for volunteers who would be willing to take a shift photographing specimens on the table and uploading them to iNaturalist, as well as taking small tissue samples of each specimen. Please email me if you would like to help out. Further details to come as the event approaches.

Specimens Sequenced at Past NAMA Forays			
Year	City	State	Sequenced Specimens
2014	Eatonvville	WA	366
2015	Black Mountain	NC	117
2017	Cable	WI	150
2018	Canton	MS	142
2018	Salem	OR	354
1997-2017			Amanitas - 227
			Total: 1,356

Watercolor Painting is Magical

By Theresa Kenney
Wisconsin Mycological Society

Dr. Denis Benjamin will be giving a demo on watercolor painting at the upcoming NAMA's 2022 Annual Foray at Trout Lodge YMCA Resort in Potosi, Missouri. Benjamin is a mycological watercolor artist and while his work is not dependent on exact representation, it is truly beautiful, breath-taking and enchanting. In his words, "watercolor painting is almost the opposite of oil painting. All the light areas have to be protected before additional layers are slathered on. There are other things to consider; it is almost impossible to fix a mistake and it is said that the paper remembers every brush stroke. Beginners must be prepared to sacrifice a lot of paper, but I was instantly fascinated. For example, how does one paint a white mushroom on white paper? Sasha asked me to bring a white mushroom for the second workshop. I found a pure white *Amanita smithianai* and, with a few deft strokes using various blues and umber, a pure white mushroom appeared on the paper. It was magical."

Dr. Denis Benjamin

The following is an interview with Dr. Denis Benjamin, conducted by Dr. Theresa Kenney.

TK: When did you first become interested in making art?
DB: 2011, at the age of 67 years.

TK: Wow so you never painted or created any art of any kind before age 67, that›s incredible, I am impressed.
DB: The only other 'artistic' thing I ever tried was learning the art of Japanese flower arranging (ikebana) while living in Seattle. Never did any drawing or painting.

TK: What did you do prior to retirement?
DB: Physician. Pediatric pathologist, Seattle Children's Hospital and Cook Children's Hospital in Fort Worth. Professor of Pathology and Laboratory Medicine, University. of Washington, Seattle.
TK: Why do you make art?

DB: It is pleasurable and challenging.
Better retirement option than growing roses, especially since I no longer have a garden.

TK: How did you get interested in mycology and botanical illustration?
DB: I was introduced to mushrooms at a wild mushroom show in Seattle in 1971. Painting began when I took a workshop with Alexander (Sasha) Viazmensky at a mushroom conference at Breitenbush Hot Springs, Oregon.

TK: How long have you been doing this type of illustration?
DB: 10 years.

TK: Can you walk us through your method?
DB: I go foraging, bring mushrooms/flowers back to my studio, set up with good lighting, sketch basic outline and then paint, OR take lots of photographs and paint from the reference photographs. I prefer live specimens when possible.
TK: For whom do you do your work?

DB: Myself, then the mycology community, botanical art community, friends, colleagues, family.

TK: Do you have a particular medium that you like to work with more than others? Why did you choose this medium?
DB: Watercolor is inexpensive, requires minimal investment, is easy to travel with and is a classic medium for botanical art.

TK: What does it feel like when you're making art?
DB: It is enjoyable, frustrating and challenging. I am continually learning and experimenting.

TK: What prompted you to teach? Do you have regular students now?
DB: I've always known that the best way to learn is to teach. I really enjoy seeing people do things that they thought they were incapable of. I only teach workshops, no regular students.

TK: How would you hope that people would respond to your work?
DB: Appreciate and enjoy it.

TK: What is the process like? What content areas have you concentrated on?
DB: I began with mushrooms, then botanicals, then landscapes and still life. Some animal art and portraits. This is the link to my website - https://www.facebook.com/benjaminwatercolors/

TK: How important is the final product? Are you ever completely satisfied with your finished work?
DB: Very important. Never yet been satisfied with the product.

TK: You mentioned having a medium that is transportable; do you paint onsite?
DB: I always travel with a sketchbook.

Painting is the best way to maintain a journal of one's travels. Might do a simple field sketch on site and then complete the painting in the studio. I am not a good landscape plein-aire artist.

TK: Where is your studio located?
DB: Currently, in the second bedroom in our condominium.

Dr. Denis Benjamin will lead a mushroom watercolor workshop at MO-NAMA 2022 on Saturday, October 1, 9:00 AM to 12:00 PM.

Dr. Shiva Devkota speaking with survivors of a mushroom poisoning event. (photo credit: Shiva Devkota)

The day before our Mycophile deadline, NAMA Foray Committee Chair Sam Landes brought to my attention the dire situation of rampant mushroom poisonings in Nepal. I emailed a list of questions to Liam Torpy, Senior Program Director of the Himalayan Climate and Science Institute, who is working with Dr. Shiva Devkota, Co-Chair of the Science Advisory Board of the Himalayan Climate and Science Institute to mitigate this nightmare. – Bruch Reed, Chief Operating Officer, NAMA

BR: What is happening in Nepal? Please explain the situation so that our members, many of whom forage but few, if any, depend on foraged food as anything other than a luxury food, can understand.

Ian Thorpy: In rural Nepal, families often rely on foraged products such as mushrooms and firewood to sustain them throughout the year. Although these communities are often more in touch with the land than the average North American, their ability to identify specific mushrooms is often limited by a lack of educational resources and training. People have an especially hard time identifying edible mushrooms because certain common genera, such as Amanita, have both desirable edible and fatally poisonous members. Because of the challenge involved in differentiating these species, Nepali citizens die each year from poisonings. COVID-19 and recent natural disasters, such as flooding, have increased these fatalities significantly, as explained in the next response.
Moreover, in the rural settings of Nepal, there are some ethnic tribes whose children are tasked with being the primary mushroom collectors. While their parents are away working late, the children are

expected to gather foraged food, often including mushrooms, while heading home from school. Then they prepare the family meal by themselves. These parents rely 100% upon their children and trust that their children can identify edible items while foraging. So far in our understanding, food gathered by children has been the major cause of mushroom poisonings in rural parts of Nepal; because of their smaller body size relative to amount consumed, children have often been the worst-affected victims. The HCSI-MCG mushroom poisoning awareness campaign specifically targets children for training and education.

BR: Is this Nepal mushroom-poisoning situation new? Is it especially bad right now and, if so, why? How long has this situation been going on? Is there a specific group of people affected? How widespread is the problem geographically and socioeconomically?

Ian Thorpy: Mushroom poisoning in Nepal is not a totally new situation. In the last few years, cases got more attention in the media due to wider coverage in social media, FM radio stations and road networking decreasing geographical isolation. These fatalities have also been accelerated by COVID-19, as the pandemic has caused increased economic hardship for Nepal due to decreased tourism, disrupted markets and inflation. This economic downturn has caused increased food insecurity in rural Nepal, causing even more people to turn to foraging for mushrooms to feed their families and survive. Because these new gatherers, many of whom are children, have even less experience and expertise avoiding toxic mushroom species, the amount of poisonings in the country has increased significantly.
Marginalized and underprivileged communities and individuals such as children and women are most vulnerable to mushroom poisoning and they consequently suffer disportionately. Many men in these rural settings, especially young men, migrate for work to access higher earnings abroad.

Dr. Shiva Devkota educating a Nepali community member on how to avoid toxic mushrooms. (photo credit: Shiva Devkota)

BR: What are the rates of poisoning? What are the numbers of people affected/involved? What are the numbers of fatalities?

Ian Thorpy: Actually, this information is very difficult to pinpoint as Nepal does not have any registered datasets to provide such a figure. But through monitoring available information from local newspapers, early published scattered data and other media, we suspect the normal figure would be at least 30 fatalities annually. Since July 10th, 2022, as a part of this poisoning awareness mission, we have started to access available information published in two national daily newspapers over the last 20 years. We are working to tabulate this data and analysing such variables as sex, age, caste, area, available medication and medical facilities, poisoning numbers and fatalities, we will be able to present the health officials and the general public with information on the demographic and socioeconomic factors associated with mushrooms poisoning problem in Nepal.
As the monsoon season has hit hard, mushroom poisoning cases are starting to appear. In some cases, mass mushroom-poisoning cases are common as neighbors go together to collect mushrooms, mix all of the collected mushrooms in a single basket and then distribute them equally among all the participants, which spreads the deadly impact of the collected toxic mushrooms. The following article details a recent tragedy of this nature:
https://nepalnews.com/s/nation/15-fell-ill-after-consuming-poisonous-mushrooms-in-butwal

BR: What are the symptoms of these poisonings?

Ian Thorpy**:** In Nepal, the majority of the cases exhibit vomiting, diarrhea and stomach cramps.

BR: What mushroom species are involved, or believed to be involved, in these incidents?

Ian Thorpy: The most commonly involved genus is *Amanita*. *Amanita chepangiana* is an edible species that is commonly collected in central Nepal. To the untrained eye, and even to many trained eyes, it is nearly indistinguishable from several other deadly *Amanita* species that have similar morphology and white coloration, such as *Amanita citrina*. Other common poisonous mushrooms are *Amanita fuliginea*, *Amanita subglobosa*, *Amanita* Section Lepidella and *Paxillus involutus*.

BR: What steps are currently underway to mitigate the dangers? Is there involvement from the local/national government?

Ian Thorpy: The Nepali Department of Health has reached out to Dr. Shiva Devkota and the Himalayan Climate & Science Institute to help address this issue. To my knowledge, there is no dedicated awareness campaign conducted by the government agencies to minimize the risk of mushroom poisoning.
Dr. Devkota has also started reaching out to media houses and journalists groups to make them aware of the growing issue of mushroom poisoning tragedies and the importance of news coverage.

BR: How did these poisonings come to your attention? How did you come to be involved in trying to help?

Ian Thorpy: Dr. Devkota has followed this issue in Nepal for several years. He was alerted of the COVID-driven increase in poisonings by contacts in the department of health of Nepal, who recognized the growing severity of the issue but who did not have resources to address it. Only a handful of mycologists are working in Nepal and they primarily study wild mushrooms. Some are retired professors and officers. Dr. Devkota could undertake taxonomic identifications of mushrooms, make the necessary travel to remote areas of Nepal to carry out mushroom poisoning awareness events and to distribute needed materials. To prevent these poisonings, HCSI is traveling to at-risk areas, holding community-wide education events, distributing educational materials with guides on how to avoid toxic mushrooms, and generating as much media as possible on the issue to increase in-country awareness of the risks of eating unidentified wild mushrooms.

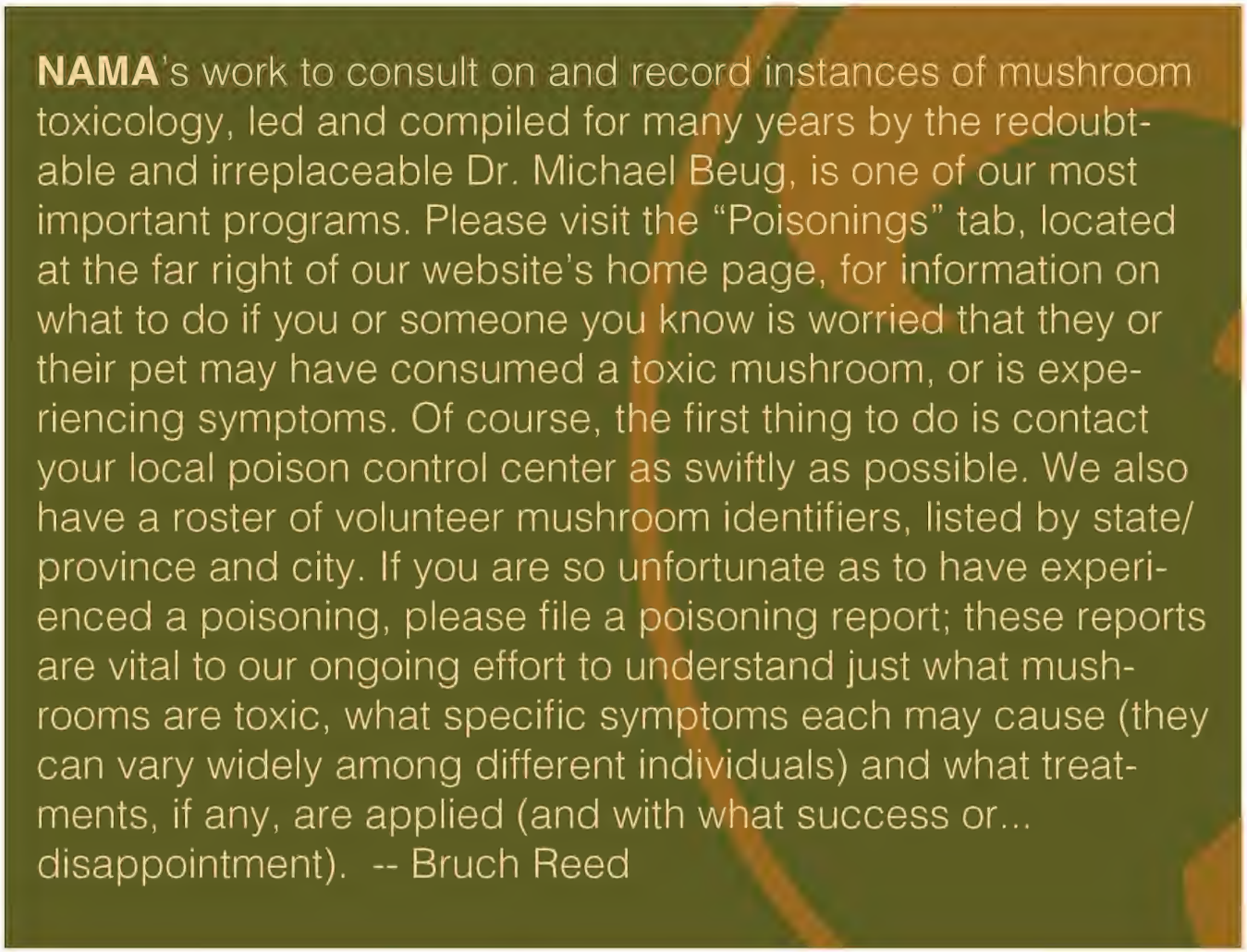
BR: Is this situation somehow unique to Nepal? If so, why would that be?

Ian Thorpy: HCIS's work is in Nepal, so we do not have expertise on the issue of mushroom poisonings in other countries. However, there is reason to believe that the issue is prevalent in other nations that rely on foraging for food or traditional medicine. We have seen reports of mushroom poisoning cases in India, and this NCBI article indicates the extent of the problem in neighboring China. The

journal article states that over 10 years from 2010 to 2020, China, with a population of about 1.4 billion people, experienced about 788 deaths from mushroom poisonings. In Nepal, which is about 1/50th the size with a population of about 29 million, there have been hundreds of less closely documented mushroom poisoning deaths over the same time span. This article therefore indicates the relative severity of the problem in Nepal and the presence of the problem in another nation. Similar poisoning cases may also be occurring in Bhutan and other neighboring countries.

BR: What can folks do to help?

Ian Thorpy: Across Nepal, whole families are being poisoned by toxic mushrooms as they forage to survive food shortages spurred by COVID-19. Fortunately, you can help prevent these recurring mass tragedies.
The Himalayan Climate & Science Institute (HCSI), in partnership with NAMA-affiliated Mushroom Club of Georgia (MCG), is spearheading a public education campaign in Nepal to teach communities to avoid consuming toxic mushrooms. By supporting this educational campaign, you can help save a life today.
This campaign is a grassroots effort with the money going primarily to printing materials and educational visits to remote villages in Nepal. Every dollar helps put an intuitive, anti-poisoning mushroom identification guide in the hands of a child who may just need it to survive.
Here is the link to the HCSI-MCG fundraiser for the project:
https://fnd.us/HCSI-Poisoning-Prevention?ref=sh_6ALHIa


NAMA's work to consult on and record instances of mushroom toxicology, led and compiled for many years by the redoubtable and irreplaceable Dr. Michael Beug, is one of our most important programs. Please visit the "Poisonings" tab, located at the far right of our website's home page, for information on what to do if you or someone you know is worried that they or their pet may have consumed a toxic mushroom, or is experiencing symptoms. Of course, the first thing to do is contact your local poison control center as swiftly as possible. We also have a roster of volunteer mushroom identifiers, listed by state/province and city. If you are so unfortunate as to have experienced a poisoning, please file a poisoning report; these reports are vital to our ongoing effort to understand just what mushrooms are toxic, what specific symptoms each may cause (they can vary widely among different individuals) and what treatments, if any, are applied (and with what success or... disappointment). -- Bruch Reed

Myco

An Old Pothunter's Thoughts on DNA Technology

By Dave Layton

DNA sequencing was barely on my radar when it drew my ire for demonstrating that one of my then favorite mushrooms; *Paragyrodon spherosporus,* was most closely related to poisonous *Paxillus involutus*. An article in *McIlvainea* cautioned against eating *Paragyrodon*. I was especially irked because *Paragyrodon* fruits in early summer before others. It's abundant here, and it's the only pothunter game in town at that time. I sent a letter to *McIlvainea* that was published listing differences between the two species, but I never totally convinced myself it was safe due to the unknown nature of the dangerous antigen in *Paxillus* that can cause kidney failure.

I learned more about similarities between the two fungi as well. One glaring similarity is the brown staining reaction in both species, which may be caused by the possibly carcinogenic chemical involutin. Reluctantly, my behavior toward *Paragyrodon* changed. I still doubt that it is poisonous - at least no more than a charred hamburger – but there's a very slight chance that DNA technology has kept me alive in the ensuing decades as I would have eaten a lot of it otherwise.

Fast forward to 2018 and the MycoFlora Project, with which Prairie States Mushroom Club (PSMC) became involved. A new PSMC member, Sarah Delong-Duhon was a biology student at University of Iowa (U of I) whose main focus was on fungi. She founded a FunDiS (previously MycoFlora Project) sequencing project for Iowa and applied for a grant, which PSMC matched. She taught us how to collect samples and document finds on iNaturalist, and we were off!

A young community scientist captures a photo while her friends look for an ID. Photo by Gabriela D'Elia.

My first collection was a fairly common *Bolbitius.* I figured no big deal if I screwed it up. Still, I was surprised at the satisfaction I got from successfully submitting it. I submitted many common and unusual mushrooms that first year while trying to fulfill our grant obligation, and I was having quite a bit of fun doing it. I was very pleased when any DNA sequences were added to my iNaturalist observations. I started to think that my mushroom hunting might have relevance beyond filling my belly, and it did! I've documented an albino tree ear (*Auricularia fuscosuccinea*), an unknown *Clitocybe*, *Russula* and parasol mushrooms that don't have a species name in America and more.

Sarah soon learned how to do the DNA sequencing at U of I. DNA extraction only takes a tiny amount of the mushroom, and after that dried collections go to the Ada Hayden Herbarium at Iowa State University. Collecting became much simpler and results more timely. And what I learned helped me with my pot hunting.

Bicolor boletes (*Baorangia bicolor)* and their close relatives are abundant in my local woods; easy-to-ID edibles like *Boletus edulis*-clade boletes are not. So bicolors are the only abundant substitute in porcini recipes – that is, if I know what I've found.

Boletus sensibilis and *Lanmaoa pseudosensibilis* grow in the same woods at the same time as *Baorangia. bicolor* and they all look the same to me. I avoided the ones with a stronger blue-staining reaction. Still, some boletes I harvested were delicious and some weren't as good and maybe even harder to digest. I dried samples of what

I guessed were each species for Sarah to DNA sequence. She also sequenced a *B. bicolor* she'd collected. My *B. bicolor* sample and hers both matched *Baorangia bicolor*. My other two samples were indeed *B. sensibilis* and *L. pseudosensibilis*.

There were two easily recognizable macro differences in my dried specimens. The one I labeled *B. bicolor* kept a yellowish color and nutty flavor when dried. The others dried to a more brown color and had a slightly bitter aftertaste. Because of DNA sequencing, I'm now certain of which boletes are good. I now dry members of any new population before trying.

The pot-hunting benefit to DNA sequencing is only a side benefit though. The main benefits we all can share in! They're the excitement of discovery and the rewards of adding to a body of knowledge that is just starting to uncover the immense diversity in the world of fungi.

Mycobathing in Woodpecker Gulch

by Dave Teitler

Ever heard what sounded like a giant eagle or mythical beast flapping its wings and snarling at you. Neither had I, until a warm, sunny August day when I set off foraging at my favorite mushroom collecting locale, Woodpecker Gulch.

2021 has been a strange weather year, though strange seems the norm these days. June was historically warm, with the mercury topping 100 degrees at my home in Carbondale, Colorado. Then came July heavy with rain, enough to close the interstate for weeks and reroute the Colorado River with heavy debris. A friend of mine asked me earlier in the year if I thought morels might come out in the Grizzly Creek burn scar above I-70. I told him, "If it rains enough to flood the highway, then yes."

Coral

Boletus, also known as porcini, popped soon after the rains began and I did my fair share of harvesting. I also scored a nice basket of chanterelles on my way to Crested Butte for a family memorial, but staying alone in a house with minimal cookware, I gave most of my booty away. Usually one to hoard such treasure, it felt liberating handing it out to friends and family. Having gorged on porcini the weeks prior, I set forth again in search of chanterelles, this time for keeps. I have always said foraging for mushrooms is a good excuse for a walk in the woods. Whether I find delectibles or not, the journey is as important as the end product. However, due to recent climatic anomalies, I expected product.

Russula

I left home with the rising sun and soon climbed the road into the high country. Halfway up, I came upon a few porcini on the still

moist, south facing slopes. This was a good sign as the north facing slopes of Woodpecker Gulch would surely be lush. Rounding a corner, I heard bleating and soon saw a herd of sheep dotting the hillside. Shortly thereafter an ATV came rumbling down the road. The driver stopped, and we chatted about what turned out to be his herd. He had driven up to drop off some salt licks and look after one of his guard dogs who was misbehaving. The dogs stay with the herd, and he comes up daily to feed and check on them. I asked how many of the herd end up dying by predation, expecting the answer to be a few. He said about 8% fall prey, and that's before the wolves come. For a herd of over 1,000 head, that's a lot of dead sheep.

Noticing my basket, he told me his daughter had just been to Lake Irwin and found a bunch of mushrooms. I told him it was a good year, and in fact there were some fine porcini just down the road which I would be happy to grab for him. He said no thanks. Surprised, I told him how well they go with a tenderloin, but he insisted he wasn't interested. I asked about the dog on the back of his ATV, wondering if it was the unruly one. He said no, this was his good dog, his Kangal. He told me she was a special breed that could take out a coyote and tree a bear without backing down. She looked docile enough so I gave her

Top Right: Amanita
Left: Elderly Amanita
Below: Boletus, als called porcini

Above: Amanita nub
Right: Amanita babushkas

a pet. Saying goodbye, he told me the sheep had been all over the frontside. I told him I was headed over the ridge. He said that side would be undisturbed. He also mentioned his other dog out in the field is about as tall as my shoulder, but he is nice and I should just talk to him should I run into him. As I was leaving, he said he was impressed I had walked all the way up. I told him I also ski here in the winter. He said that's what this country is for.

After a quick sip of water atop the ridge, I headed over and soon found the elk trail which is my entry point into the musty underworld of Woodpecker Gulch. Aside from a few hunters in the fall, it is a destination few people have cause to venture. Upon entry, it was immediately clear the rains had sprouted a cornucopia of fungal activity. Stepping off the elk trail, I found myself swimming in a sea of shrooms, treading water amongst amanitas, coral, porcini, fairy fingers, hawk's wings, puffballs and other unidentifiable toadstools in reds, browns, yellows, whites and purples.

Hawk's wing

The sun was high, yet thin cloud cover and the smoky haze from Western fires lent ideal light to the forest floor. I soon found myself snapping pictures, drawn more toward the next flush of colorful mushrooms than orienteering toward my favored chanterelle patch. I became enthralled by the life cycle of the Amanita Muscaria. Stout, white-headed babies, Alice in Wonderland speckled orbs of precocious adolescents, disk-like spreading midlife forms and finally the drooping and shrivelled elderly, babushkas gossipping on a park bench.

Meandering rather than navigating, I overshot my intended destination. Rather than reorient, I continued across the forest floor and noticed a porcini poking out from underneath a thin, fallen tree. Walking to photograph it, I nearly trampled a cluster of chanterelles next to the tree. Drawn from my mesmerized state and reminded of the task at hand, I harvested the larger specimens and began shifting my focus from observer to gatherer. A second larger patch soon presented and I began filling my basket.

Puffballs

Uncertain of my exact location, but certain I had found my third patch of the day, I set down my basket and knelt to pick the first of the bunch when I heard the aforementioned sound of what my mind could only register as some sort of thunderclap of wings. Looking up I expected to see an eagle or some other bird of prey swooping down, but surprisingly saw nothing. Hearing another whoosh, whoosh above, I looked up expecting a large owl. Instead, I shockingly saw a full grown bear clinging to the tree trunk about 15 feet overhead.

The week before, I had been foraging for porcini with my cousins when after hearing a snort, we looked up to a juvenile, male moose. At the time, we thought it sounded urgent and demanding, but interpreting the moose's snort in retrospect, it seemed to be saying, "Hey guys, I was here first enjoying my solitude and foraging for some succulents down by the creek, so if you don't mind taking a few steps back and respecting my privacy, that would be great." This was in opposition to what my current furry friend was saying, which could be clearly interpreted in bear as, '"Get the fuck outta here, now!"

In the nano-seconds it took my brain to compute scared, snorting bear, probable cubs in vicinity and the fact she could hop off the tree and land on my shoulders if she so desired, I rose urgently enough from my seated position to tweak my mid-thoracic back as I swirled to grab my basket and skedaddle. She shimmied farther up the tree

Lactarius Deliciosus

and continued snorting as I backed away in an adrenaline rush, snapping a few shaky iphone photos in retreat.

Remembering her words and with zero regrets, I left the third chanterelle patch untouched by human paws. Criss-crossing the forest floor, both petrified and exhilarated, I realized I was quite hungry. I sat to eat my sandwich, but was so amped I ate walking in circles. Only able to eat half the sandwich, I put my pack back on and headed uphill in the general direction of what I hoped would be the original chanterelle patch. Gotta get back in the saddle, they say.

I had seemingly gotten my bearings and was quite sure I was about to crest the rise to the original patch when I heard the now familiar set of snorts, grateful at least this time the sound was moving through the forest rather than directly overhead. Nevertheless, I froze momentarily. Deciding I may as well walk as stand still, I crested the rise to what was indeed my original patch. Just above, running uphill and climbing a tree, was the bear. She quickly shimmied back down and headed uphill out of sight, followed by a pair of cubs.

The Japanese have a concept called Forest Bathing. Shinrin-Yoku is also translated as taking in the forest atmosphere. According to Qing Li in an article for Time Magazine, forest bathing is not exercise. It is simply being in nature, connecting with it through the senses, walking aimlessly and slowly, following your nose. It doesn't matter if you don't get anywhere. You are not going anywhere. You are savoring, listening to the birds sing and the leaves rustle, watching sunlight bounce off the forest floor. Forest bathing is crossing the bridge between us and the natural world.

Left: Mother bear in tree
Below: Chanterelles

Unidentified brown mushroom

Above: Amanita
Below: Amanitas

When I first heard the concept of forest bathing, I realized that is what I do while foraging. More succinctly, that is foraging- a slow meander through the forest, no set agenda, no particular destination, unfurling wonder around each bend. My friend Tony once remarked that it's great to get out with people, but it's always better alone. It was his way of saying to cross that bridge, it is best done in solitude.

Years ago, hiking with a basketful of chanterelles down the same slope now populated by sheep, I met a man scouting the area for fall hunting. Wide eyed, he looked at my basket and asked where I got them. I told him they are all around, but I found these in Woodpecker Gulch. He said I know this area well, where is Woodpecker Gulch? I replied

Dave Teitler enjoys the outdoors and gets his mushroom eyes on if the summer rains come. When not romping around the woods, he can be found tending his vegetable garden, hanging with family and friends or working at his Chinese medicine clinic in Carbondale, CO.

A Lab of One's Own

How the New York Mycological Society Got DNA-savvy and How You Can Too

By Sigrid Jakob

Photos by Sigrid Jakob

When people think of New York City, they think of skyscrapers, Broadway shows, a diversity of people and neighborhoods. One thing New York City is less famous for is fungi (unless they're on a $1.50 slice). People generally assume that we're more concrete jungle and less wild nature. And that includes even fungophiles. New York City has been home to three mushroom clubs over the last 125 years and all three have spent most of their time looking for fungi in the surrounding counties and states, not local parks or cemeteries. The same is true even of the professionals. The famous *Russula* expert Gertrude Burlingham taught high school in Brooklyn for over 30 years and never collected a single *Russula* from her local park, Prospect Park, a mere half-mile from her apartment.

The assumption was simply that beyond a few edibles there were few fungi of interest to be found in the Big Apple.

This perception began to change a few years ago when Gary Lincoff, the club's sage and unofficial leader, encouraged the club to check out the city's parks. Gary himself lived only a couple of blocks from Central Park and was a diligent cataloguer of its fungal inhabitants. Lo and behold, it turns out that New York's fungal communities are just as rich and diverse as its human communities. New York Mycological Society (NYMS) has officially documented well over 1,300 species on iNaturalist alone and our rate of discovery is only accelerating. Observing and documenting the city's tremendous diversity became the club's obsession. It's why we have mushroom walks 52 weeks a year, even in the snow.

On almost every walk, we come across species that baffle us. Many have yielded their secrets thanks to the diligent microscopic work of ascophiles like Ethan Crenson. Others remain enigmas despite our best efforts. How many rare and undescribed fungi have we brought to our ID session, only to throw them on the compost if they refused to yield their secrets?

It was Gary again who encouraged us to jump on the molecular bandwagon by joining the North American Mycoflora Project back in 2018. NAMP's mission was to make DNA sequencing accessible and affordable to mushroom clubs everywhere and we were game. Despite a lack of qualifications, I was roped in to become the joint leader of the club's NAMP project.

As promised, our NAMP sequencing did indeed reveal all kinds of treasures.. It also introduced me to the world of Genbank, BLAST and MyCoPortal. But it also made me impatient; I wanted to learn about many more of the species we were finding than our grant allowed – and I wanted the answers now, not months later. The slow trickle of results wasn't NAMP's fault – a pioneering organization run entirely by volunteers - I was merely impatient and eager to learn.

But the idea of doing my own sequencing seemed beyond the pale. I had no background in the sciences and sequencing seemed to require an advanced degree in biochemistry. This all changed when I came across Alan Rockefeller at the 2018 Santa Cruz Fungus Fair, produced by the Santa Cruz Fungus Federation., calmly extracting

DNA right in the middle of the busy exhibition hall. He handed me a flyer of his protocol and right there and then I decided that this is what I wanted to do more than anything in the world.

A year later, having slow-watched Alan's videos many times over (and dropping some cash on equipment and reagents) I had my own lab, doing fungal extraction, amplification and gel electrophoresis at home. I've also had the benefit of a number of great mentors and a very helpful Facebook group. I've sequenced my own finds and those of the clubs ever since - about 750 to date, It's been a tremendous journey - I've learned a ton about fungi and about science, met wonderful people, found dozens of new or un-sequenced species, hundreds of rare fungi, had many lovely exchanges with mycologists. It's made me a better observer, documenter, community scientist and expanded my horizons in all kinds of unexpected ways.

How the New York Mycological Society uses DNA barcoding

When I took over the presidency of the club early last year, I had two agenda items I was eager to push: greater collaboration with the diverse communities of New York City and integrating DNA sequencing more closely with the club's everyday collecting and documenting.

Here's how this agenda has manifested so far:

Building DNA literacy
The club has offered lectures on DNA sequencing every year to introduce our members to the potential (and the challenges) of DNA sequencing and its role in community science. Lectures can be viewed here and here.

DNA hands-on skills
NYMS offers free DNA-sequencing workshops every few weeks in a small group, hands-on environment. Members learn not only the core skills of DNA extraction, amplification and gel electrophoresis but also how to read and interpret sequences, and why uploading to GenBank is so important. Over 25 members have participated in these workshops. More workshops are planned for the summer, some in partnership with a local community lab.

Free use of a DNA lab
Once they've taken a workshop, members are free to borrow a lab to take home and use themselves, along with a detailed protocol and videos. While this might seem risky, it's not; I'd rather see the lab used than sitting in a closet. The club may well decide to buy its own lab in the future, but right now it's my own lab we're lending out. Six members have borrowed the lab so far and more are on the waitlist. In fact, three other members of our club now own their own labs, and will be able to help sequence the club's collections.

Routine DNA sequencing of unusual specimens
We have sequence specimens we find on our weekly walks that strike us as unusual, or worthy of exploration for other reasons, For example, because a new paper has changed our understanding of a common species.

iNat is at the cornerstone of the club's documentation and collecting. Sequences and IDs are posted to the iNat observations of those finds, and are collected in a dedicated iNat project. We do not sequence collections that don't have an iNat or Mushroom Observer record attached to it.

Upload to GenBank of all sequenced specimens
We think it's important that all DNA sequences get uploaded to GenBank. This is a simple process that only takes minutes, but provides valuable data for science. Right now, I'm in charge of GenBank uploads but other members with labs are interested in doing it themselves.

A fungarium of sequenced collections
It's important to have a dried specimen for all sequences for science, so that further microscopy and additional sequencing can be performed by future scientists. Ideally, these "vouchered" specimens are accessioned by a herbarium/fungarium, but in practice this step has been more challenging. Our local herbarium, the New York Botanic Garden (NYBG) herbarium, does not have the resources to accession our collections right now; the pandemic has extracted a deep toll on institutions like it. We have deposited some of our specimens with the Botanical Research Institute of Texas, a wonderful institution. Many are still kept in members' personal herbaria. Stored in sealed plastic bags in a dark and dry place, with a numbered label, they await their final destinations.

What have we found?

DNA sequencing has allowed us to put names on a number of collections of very rare species such as this and this and this and this.

Dictyosporium elegans

It has also unearthed what are likely undescribed species, or at least species not represented in GenBank such as this and this and this.

We lost Gary in 2018, but I believe he'd be thrilled with all of this progress if he was still around. He was a strong believer in the power of amateurs to make contributions to science. I'd like to think that he'd be surprised and delighted by some of our finds, and he'd be pressing us to sequence even more.

What are other clubs doing?

Many clubs have been sequencing for a while. There are a couple of clubs doing exemplary work that has vastly increased knowledge of their local fungal diversity.

One of the most comprehensive examples of using sequencing in the service of documenting fungal diversity comes from Indiana, where Stephen Russell has sequenced over 10,000 specimens of local fungi, many collected by the Hoosier Mushroom Society. About half turned out to be either new, not in GenBank, or different enough from existing species to require a temporary code name – yet more proof of the tremendous fungal diversity all round us!

The Arizona Mushroom Society has, under the leadership of Terri Clements, successfully sequenced over 700 specimens, of over 500 taxa. An astounding *70% of these represent taxa that are either newly described, unexpected to occur in Arizona or are possibly novel.*

Other clubs that have sequenced many collections, either through NAMP/FunDiS, or other resources are Puget Sound Mycological Society, South Sound Mushroom Club, Sonoma County Mushroom Association, Michigan Mushroom Hunters Club, Fungus Federation of Santa Cruz, Northwest Mushroomers Association and many more.

A new generation of clubs has been dipping a toe into the water of doing the sequencing themselves; clubs like the Alabama Mushroom Society, (which found a whole slew of species not in GenBank on their very first try), the Nebraska Mycological Society and the Mushroom Association of Washington, D. C.

How can my club get into DNA sequencing?

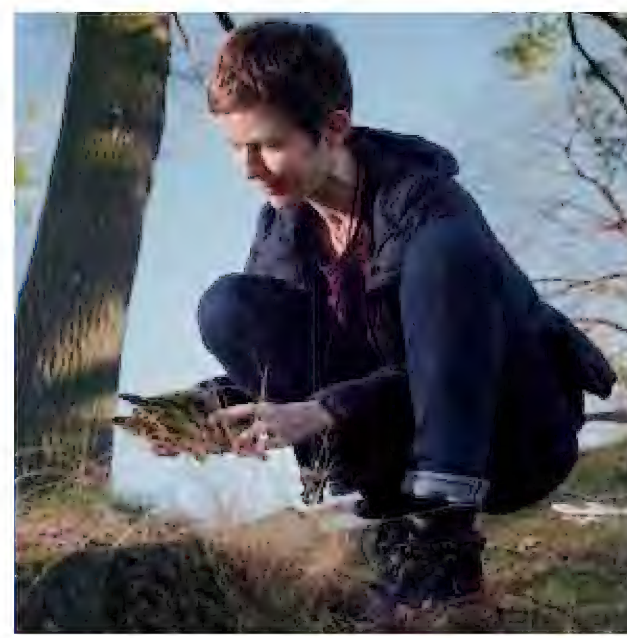
The answer up until recently would have been: through FunDiS (formerly known as the North American Mycoflora Project). This is not possible right now because the organization does not have the grants to restart its sequencing program. Instead, they are focusing on fungal conservation through a couple of innovative programs. This could change again in the future, so do follow them on social media to stay up to date.

For right now, one option for clubs is to use commercial services like AlvaLab and Molecular Solutions. They do all the work for you; costs per sample range from $20 to $30 plus shipping, and processing times require patience.

The other option is to invest in a DNA-sequencing lab. This requires an initial investment from under $1,000 (used equipment) to $1,400 or more using new equipment from companies like miniPCR. There is an additional cost of $3 tp $8 per sample for Sanger sequencing (the one step of the process that can't be done at home). A typical session of sequencing 16 specimens takes about 90 active minutes and three hours of waiting time while PCR takes place.

To find out more, check out my protocol and videos, which lists the equipment needed and the techniques people are using to extract, amplify and test their samples.

Today, PCR and Sanger sequencing are the only game in town but this is changing rapidly. The Oxford Nanopore MinION technology still requires extraction, but not PCR, gel electrophoresis or Sanger sequencing. Prices have been coming down and accuracy has increased. It delivers best in situations where many collections have to be sequenced at once, like a foray. Few people in the fungi world have actually used it yet, and there will be a steep learning curve. Stephen Russell, a co-founder of NAMP and creator of MycoMap will begin using the MinION later this year and many of us will be watching to see whether this is a technology that works for the needs of a club.



Sigrid Jakob is a New Yorker with a particular interest in Russulas, Amanitas, Inocybacae and coprophilous fungi, but generally enchanted by fungi of any kind. She does PCR at home and will attach DNA sequence data and GenBank accession numbers to fungi where possible. Currently Jakob is serving as President of the New York Mycological Society, and co-lead of the Green-Wood Cemetery Fungi Phenology Project

Mycophagy

Mushroom Nutrition & the Vegan Diet

By Zachary Mazi

The topic of mushroom nutrition, especially as a substitute for nutrient-rich meats, has been a central theme to vegetarians and vegans for some time but the "exotic" mushroom industry has been seeing a boom over the past several years that has excited many producers. There is certainly an ever-growing awareness of the dangers of doing the same thing (and expecting different results), and partnering with fungi and with mushrooms in every aspect of our lives is something we as a species haven't yet fully embraced.

Mushrooms are the nutrient-dense fruit bodies of the mycelial mat (the true body of the fungus) and that mat covers vast areas of ground below us, in some cases measured in hundreds of acres rather than square feet. These dense networks of single-cell-thick tubes have been estimated to comprise of up to five miles of fibers within a single cubic centimeter of soil. Like our own nervous or circulatory systems touching every cell in our bodies, the mycelium is able to access every part of the forest, transferring nutrients from tree to tree using sophisticated trading programs that seem to behave more like capitalism rather than a simple release-and-absorb protocol that we have ascribed to nature. Fungi regulate the literal health of an ecosystem.[1] Though it seemed a fantasy at the time, the images of the mother tree with roots connecting the whole Earth in James Cameron's movie *Avatar* weren't that far off. A new project launched in 2021 now aims to map this vast network of fungal fibers, estimated to cover astronomical distances.[2]

More than just a simple transference of materials, it has also been observed that the fruit bodies of fungus – what we call mushrooms, generally – including the many edible varieties, have the tendency to hyper-concentrate whatever is in their environment, as well as become a hyperdense source of the same chemicals contained in the dispersed mycelia network below ground. In fact, all parts of the mushroom (excepting the basidia, on which the spores are produced) are made of mycelium that is more densely packed, excreting various chemicals, colors, scents and textures, to aid in the above-ground release of spores.

Given this tendency, it should be no surprise that mushrooms would also be bastions of nutrients necessary to the survival of other species. By offering essential amino acids, fats, myco-sugars and a wide variety of medicinal constituents, or intensely desirable aromas (desirable being quite subjective) plays to the advantage of spore dispersal. Mature mushrooms are full of spores and, as far as the fungi are concerned, spore distribution can utilize any number of clever ways to help fungi reproduce successfully.

The exhaustive list of nutrients from even a single species of fungus is too long for this essay. In short, it includes all the macronutrients – proteins (and amino acids), carbohydrates and fat – as well as a whole host of biological chemical suites, often exclusive to the mushroom itself, appearing nowhere else in nature.

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1 Franklin, O., Näsholm, T., Högberg, P., & Högberg, M. N. (2014). Forests trapped in nitrogen limitation - an ecological market perspective on ectomycorrhizal symbiosis. New Phytologist, 203(2), 657–666. doi:10.1111/nph.12840

2 https://www.euronews.com/green/2021/12/02/scientists-are-mapping-the-world-s-fungal-networks-for-the-first-time-here-s-how

Boletus Edulis

Beyond being nutrient dense, mushrooms also clean up their environment by hyper-concentrating heavy metals, chemicals, and even radiation from their vicinity. It is therefore strongly advised to know the chemical history of the area in which you are picking wild mushrooms, but also for anyone supplying wild mushrooms commercially. For example, some apple orchards in the East and Midwest of North America have dangerous levels of arsenic left over from practices not used for decades: *Morchella* species (morels) happen to hyper-concentrate arsenic *and* grow in these very orchards.[3] Chanterelles in particular are known to concentrate radiation from the environment, such as radioactive cesium. In the forests around Chernobyl, located in Ukraine, fruiting bodies were found with 10,000 times the radiation of their surroundings.[4] Sometimes mushroom poisoning has more to do with the surrounding environment than the mushroom itself.

Though it seems that up to 90% of these radioactive toxins were eliminated by… pickling![5] You go, primitive kitchen science, keep on doing you.

To my surprise, there is a considerable range of people who consider themselves "vegan." As the name would seem to imply, the practice of being vegan ought to mean consuming vegetive sources of nutrition, though it seems most vegans define their diet more by what they do not eat, with no consumption of any animal-derived products whatsoever (dairy, meat, eggs or even honey). In a culinary world of only two kingdoms, flora and fauna, these definitions are more or less the same. Simple enough.

However, a vegan diet almost always includes mushrooms which, as outlined above, aren't vegetables at all, (despite being ubiquitously listed in the vegetable section of virtually every cookbook, much to the ire of this author). In fact, the more we examine the many evolutionary kingdoms employed in culinary sciences (algae and seaweeds are *eukaryotes*, bacteria from prokaryotes and fungi) the more the definition of vegan as the exclusion of only Kingdom *Animalia* becomes more appropriate.

Parsing these kingdoms out in a more modern understanding of our culinary heritage is important. The cooking of mushrooms can be complicated, as each mushroom exhibits different traits. The common practice still employed ignorantly today by nearly every cookbook and culinary school of lumping all of these disparate traits under a single heading in the vegetable section is an insult to cooks everywhere. Not only do fungi rep-

3 "Lead and Arsenic in Morchella esculenta Fruitbodies Collected in Lead Arsenate Contaminated Apple Orchards in the Northeastern United States: A Preliminary Study"; Elinoar Shavit and Efrat Shavit

4 Orita, Makiko et al. "Activities concentration of radiocesium in wild mushroom collected in Ukraine 30 years after the Chernobyl power plant accident." PeerJ vol. 6 e4222. 5 Jan. 2018, doi:10.7717/peerj.4222

5 Falandysz, J., Meloni, D., Fernandes, A.R. et al. Effect of drying, blanching, pickling and maceration on the fate of 40K, total K and 137Cs in bolete mushrooms and dietary intake. Environ Sci Pollut Res 29, 742–754 (2022). https://doi.org/10.1007/s11356-021-15523-9

resent their own kingdom on the evolutionary tree, just as animals and plants are within their own kingdom, but evolutionarily speaking, Kingdom *Fungi* paved the way for plants to take root on Earth (literally manufacturing the soil in which plants grow) and then went on to split from Kingdom *Animalia* next, proceeding to continue on its way – after these two Kingdoms sprang from its forehead – to nurture and create the very environment in which to raise its two children, *Flora* and *Fauna*. In this author's incredibly biased opinion, not giving the parent a section in the cookbook while dedicating so many to its children is juvenile (no, not you… it's a built-in bias we all have, whether we realize it or not). If I live to see the day that FUNGI are given their own section in cookbooks, I will die an accomplished mycophile. *Funga* is at least as equally important as *Flora* and *Fauna*, if not more so. And this author is far from the only one who has noticed: "Giuliana Furci, the founder of Fundación Fungi (Fungi Foundation -- the first NGO for fungi of the world) is trailblazing justice for fungi by revitalizing our very perception of them, through changing language and worldwide school curricula."[6] A detailed examination of fungi is long overdue throughout the global community.

Beyond the nutritional analysis of each mushroom, fungi nutritional physiology is interesting as well. Unlike plants, whose cell walls are made up of cellulose, or animals, whose cell walls are made up of lipid barriers and cholesterol, the cell walls of mushrooms are made up of chitin, exactly the same constituent of arthropods and crustaceans. The digestion of chitin by mammals was thought to be impossible, as mammals do not manufacture chitinase, the necessary constituent to break down chitin during digestion, leading to the nearly unanimous belief that cooking mushrooms is crucial. "Cooking" means to render them digestible, to release from cells the complex nutrition inside, and to begin the heat lysing and enzymatic breakdown of the tissues to create even more flavors and aromas in the process. Scientists have now found that animals such as pangolins and bats, whose diet consists largely of eating insects, do in fact have chitinase-like chemicals in their digestive tract. But moreover, humans who tend to consume more mushrooms have also been found to have chitinase in their digestive juices.[7] It is this author's intuition that because we have more bacterial cells in our digestive tract than human cells, this production of chitinase is likely more related to the genes of the biome within us than our own genetics which, incidentally, are outnumbered one hundred-fold![8]

It has always tickled me a little, having dealt with the more militant types of vegans as a caterer, retreat chef and restaurant owner, that the majority of fungus we exploit for our own nutritive purposes are most like the vast neural networks of the animals so strictly avoided. Fungi, being more closely related to animals than plants after all, breathe in oxygen, breathe out CO2, and ingest their food after secreting digestive juices; a process not dissimilar to our own digestive processes.
Like animals, fungi are metabolizers, breaking down their food—"de-molecularizing" it, as Paul Stamets has stated—even rendering deadly petro-chemicals such as diesel and plastics into harmless and nutritional mushrooms sugars. Their networks are the precursors to both our own neurons and, by extension, to the interwoven structure of "the Internet." There can be no doubt that we humans are not original builders. We, as animals, are more closely related to fungi than we are to plants. I wonder if this ever gives vegans pause before sinking their teeth into their portobello burger.

Mushrooms are the fruit of a body so very different, and yet so very similar to the animals vegans so eschew. Fungi are intelligent. Fungi were the first organisms to utilize the technology of branched and "chaotic" biological patterns that animal bodies now employ to survive in this complicated world such as nerves, circulatory systems, our digestive absorption processes and even our epigenetic expression of traits.

Of the three macro-kingdoms, it was *Fungi* that arose first, and not until many millions of years later, having started to break down Earth's rocks into soils and culture bacteria, did fungi split from their energy-capturing photosynthetic children (plants) and again many millions year later, once oxygen began to be more abundant, split from the quantized and free-roaming *Animalia*, who then began their own convoluted and unfathomable tumble through evolution to the world of animals and humans we see today.

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6 https://fundis.org/resources/blog/137-justice-for-fungi-through-project-fe-and-the-3-f-s

7 Paoletti M, G, Norberto L, Damini R, Musumeci S: Human Gastric Juice Contains Chitinase That Can Degrade Chitin. Ann Nutr Metab 2007;51:244-251. doi: 10.1159/000104144

8 Qin, J., Li, R., Raes, J. et al. A human gut microbial gene catalogue established by metagenomic sequencing. Nature 464, 59–65 (2010). https://doi.org/10.1038/nature08821

Fungi are equally diverse, if not moreso, than any other Kingdom and are sequestering more carbon than all animals combined by a factor of six (which means fungi are sequestering more carbon than humans by a factor of two hundred). Meanwhile, it is fungi that created (and continue to create) all of the soil, and still play the most managerial role in the forest, mitigating the transfer of nutrients in the soil between otherwise diverse ecosystems. The newest evidence suggests that bacteria are able to travel along the minute fibers of mycelia like a superhighway system![9] We may never grasp the depth of the role that mushrooms and fungi play on this planet. They are truly astounding. But at least we can try.[10]

So, are fungi technically vegan, given their physiological similarity to animals? The answer may depend on the philosophy of the specific vegans you ask, though unlike animals – and perhaps more like fruit trees – the eating of mushrooms does not harm the mycelial creature creeping below the surface of the Earth. But given the vast array of animal-like nutrients contained within the pantheon of edible fungi, a vegan diet without mushrooms probably isn't advisable. Given their concentration of everything desirable to leading a healthy human life, no diet, vegan or otherwise (excluding those with allergies and food sensitivities, of course) is complete without a variety of wild and cultivated fungi.

Zachary Mazi is a professionally trained chef who lives with his fiancé in Oaxaca, Mexico, where he leads myco-forays partnered with indigenous communities to teach people about the intersection of cuisine, culture, and the natural world. He is an active member of NAMA and serves as an active member of NAMA's Culinary Arts Committee. He can be followed or messaged on Instagram @Mycophagybook or online at mycophagybook.com.

Amanita Civiche

Black Trumpet Arancini over Sauce Bechamel

By Spike Mikulski

Yield: 20 each

2 Quarts Chicken Stock
8 Ounces Salted Butter
2 Large Spanish Onions
1 pound Fresh Black Trumpet Mushrooms
1 pound Ground Veal
8 ounces Arborio Rice
1 Quart Heavy Cream
1 pound Swiss Cheese, grated
4 Large Eggs
1 Pint of Water
1 Teaspoon Dried Chili Flake
1 Tablespoon Dried Parsley
3 Cups Breadcrumbs
3 Cups Corn Flakes, pulsed in a food processor
3 Cups All-Purpose Flour
1 Dozen Whole Cloves
Kosher Salt

In medium sauce pan heat 2 quarts of chicken stock to a simmer
Heat 2 ounces of butter in a medium stock pot, fine dice 1 onion, add to pot, stir for about 3 minutes to sweat.
Rough chop the black trumpets, add to pot, stir for about 3 minutes or until aromatic.

Add the ground veal and disperse evenly into the pot, season with a pinch of the salt, raise the heat to high and brown the meat well.
Add the cup of arborio rice and stir vigorously to coat, Continue for about a minute.
Ladle 1 cup of hot chicken stock and stir into the rice, lower heat to a simmer, cook on low for about 5 minutes or until rice has absorbed the chicken stock and add another cup of chicken stock, continue this process until the stock is gone.
Remove from heat, add 3 ounces of the heavy cream and the swiss cheese, stir until well blended.
Spread the hot rice mixture across a baking sheet and chill in refrigeration.
Roll the cold rice mixture into golf ball size spheres and place on a greased backing pan, place in a freezer until solid.
Set up a 3 tray breading station with one tray holding 2 cups of flour seasoned with a generous pinch of salt, one tray with the eggs, the water, and 4 ounces of cream, one tray with the breadcrumbs, cornflakes, red pepper flake, dried parsley, and 4 ounces of flour, blend well all the ingredients in each tray.
Bread the frozen rice balls by dredging in the tray of flour, then in the tray of egg mixture, lastly in the tray of seasoned breadcrumbs.
Preheat deep fryer to 275° F and blanch the arancini until barely light brown, place on a rack lined baking sheet, set aside in refrigeration until ready to serve.
Bake at 375° F until nicely brown and crisp before serving, serve on top of the Bechamel sauce.

For the Sauce:
In a medium sauce pot on medium heat melt 4oz of butter, add the remaining 4 ounces of flour to make a roux, stir continuously until the roux has colored in blonde, gradually add the remaining cream, bring to a boil then set to a simmer.
Skin the remaining onion, push all the cloves into the onion evenly and add to the pot, simmer for 20 minutes.
Adjust flavor with salt to taste, adjust consistency with water to desired thickness, mount with remaining butter.
Strain and set aside, heat before serving.

Cooking in our Kitchens and with our Clubs:

A Review of *The Fantastic Fungi Community Cookbook,*

Eugenia Bone, editor.

Insight Editions, 2021

$24.49 on Amazon.com

By Barbara Ching, NAMA Past President

Inspired by filmmaker Louie Schwartzberg's *Fantastic Fungi* (2019) and Schwartzberg's follow-up suggestion that Eugenia Bone write a mushroom cookbook, Bone decided to tap into the mycelium-like network of mushroom enthusiasts to write a community cookbook. We mycophiles did our share by contributing recipes – see some of the submissions here: https://fantasticfungi.com/ Bone tested each recipe as part of the selection process. She also contributed an above-and-beyond level of community service by talking with the selected recipes' contributors to ensure she got everything right and to learn about how they became mycophiles. This information is compactly worked into the recipe headnotes. Evan Sung's carefully styled photographs illustrate most of the recipes and heighten the project's inspirational, encouraging tone.

While there is some overlap with Kristen and Trent Blizzard's approach in their *Wild Mushrooms: A Cookbook and Foraging Guide*, the books complement each other. The Blizzards profile their foragers in absorbing detail and with lively photographs. The *Fantastic Fungi* collection provides less introductory information about mushroom species and foraging. Bone wrote five essays for the collection, with a scientific slant on washing, sautéing and food safety, on understanding the difference between mushrooms

that can be cultivated and those that rely on a complex ectomycorrhizal ecosystem that eludes us, on growing and harvesting truffles, on the nutritional and potential medicinal properties of mushrooms, and on the role of fungi in building the soil and strengthening plants that underlie our agricultural system.

Each of the *Fantastic Fungi Community Cookbook*'s seven sections places emphasis on mushrooms as a core ingredient: "Mushrooms on their own or with vegetables," "Mushrooms with fish," "Mushrooms with poultry and meat," and so on, including sweet recipes. The recipes offer a comfortable blend of ambition, spanning from a simple chanterelle-infused vodka, contributed by Kelly DeMartini to enhance her chanterelle risotto (recipe also included) to the dreamy chef concoctions Graham Steinruck serves at Telluride Mushroom Festival, such as candy-cap eclairs with reishi chocolate glaze. A helpful index sorts the recipes by mushroom type, and many recipes work with "mixed" mushrooms. (I wish there was an index of contributors and recipes; instead, there is a detailed table of contents with each recipe and its contributor listed in order of pagination). Evan Sung's beautiful photographs illustrate most of the recipes.

I flagged many recipes to try; I chose two simple recipes to test: the sour cream-based dried porcini dip that opens the book and Oaxacan wild mushroom quesadillas. I was drawn to the mushroom dip, contributed by Alison Gardner, because I had reviewed her earlier *Wild Mushroom Cookbook: Recipes from Mendocino* (co-authored by Merry Winslow) in a past edition of *The Mycophile* and had admired the book's vast selection and creativity. This recipe continues that lively tradition with an unexpected pinch of dried candy caps. The dip greatly exceeds the sum of its parts, with a silky texture and shroomy intensity. You can try the recipe here: https://food52.com/recipes/86781-dried-porcini-onion-dip-recipe.

The quesadillas were a hit in my house; contributor Jane B. Mason of Colorado wrote the recipe to accommodate whatever mushrooms you have on hand, and I had chanterelles and chicken-of-the-woods. Cooked with grated cheese, chopped onions and epazote, the dish came together quickly – especially since I used store-bought corn tortillas. Next time though, I intend to follow Mason's clear instructions for homemade tortillas. Next up will be Linguine with lion's mane white clam sauce, by Jean O. Fahey, the "mycophagist" for two of our affiliated clubs: The Central New York Mycological Society and the Mid York Mycological Society. We shared Sebastian Carosi's recipe for sausage-stuffed morels in the last issue of *The Mycophile.*

I've been cooking mushrooms for years and regularly review cookbooks for *The Mycophile*, and I learned a lot from reading the *Fantastic Fungi Community Cookbook* from beginning to end. NAMA members who eat wild mushrooms will want to take part in *the Fantastic Fungi* cooking community by adding this book to their collection and even finding ways to share their own recipes. How about contributing them to *The Mycophile* or your club's newsletter?

NAMA

News, Fun Facts
and Announcements

Enter the 2022 Visual Arts Contest

by Rose Tursi, NAMA Arts Committee Chair

After the astounding success of last year's inaugural visual arts contest, we've decided to continue the tradition for 2022! We are keeping the rules, categories and prizes the same but this year we are adding a theme. To coincide with the State Mushroom Initiative, we have chosen 'State Mushrooms' as this year's theme! Currently only three states have official mushrooms—and only one state has an official lichen—but several more are in the works. Most states are a completely blank slate. We're asking you to think about what fungus you believe best represents your favorite state, and use that as the spirit of your art piece. Consider also Canadian provinces, Mexican states and U.S. territories—we are the 'North American' Mycological Association after all. Be creative in how you choose to interpret this theme, we can't wait to see what you come up with!

Categories:
Photography
Digital Art
Drawing and Painting—Traditional
2D Mixed Media – Traditional
3D - Sculpture
3D - Sewing and Fiber Arts

All forms of art are accepted; when submitting, please choose the category into which you feel your work best fits. See Category Guidelines below.

Rules:
Participant must be a resident of North America. Membership in NAMA is not required.
Each participant may enter up to 6 pieces total in the contest, with no more than 3 entries for any one category.
No "adult" content; entries must be "family friendly."
Art must visually depict fungi somewhere in the piece and/or use fungi as an ingredient (for example, dyed or painted with pigments made from mushrooms, dried mushrooms in mixed media, etc.).
By entering, entrant agrees to allow NAMA the use of submission images in our newsletter, social media, and printed promotional materials. (Please include your @name if you would like to be tagged on Instagram.)

Prizes:
First Place winner in each category will receive a one—year membership to NAMA.
Honorable—Mentions may be presented for entries found to be of particular interest but that do not place. Winners will be announced and notable entries displayed in a slideshow presentation at NAMA's Annual Continental Foray, this year to be held in the Missouri Ozarks, September 29—October 2, 2022.

Submitting:
Submit one (1) photo per entry (3D categories may submit up to 3 photos per entry) preferably in .jpg format and in a high enough resolution that it can be projected on a screen without pixelation.
File name must be labeled with identifying info such as entrant's name and category (for example: JonSmith.Sculpture.jpg.) Email your files and any questions to NAMA Visual Arts Committee: NAMA-visualarts@gmail.com
Include "NAMA Visual Arts Contest" in the subject line and other relevant info in email.
Entries must be received by September 15, 2021. Voting will be conducted by an impartial jury of professional artists selected by NAMA's Visual Arts Committee.

Category Guidelines:
Photography: Scientific and Pictorial photographs. Include species name. Entries may not contain text, stickers/clipart, other design elements etc. (please enter those under the category Digital Art).
Digital Art: Includes photo manipulation, digital illustration, digital collage. May include some animated elements (for example, a GIF.)
Drawing and Painting: Traditional pencil/charcoal drawings, ink, markers, watercolor, gouache, acrylic, oil, etc.
2D Mixed Media: Traditional artwork in which more than one medium or material has been employed. This category includes collage, assemblage, etc. Art can have some dimensionality, but is viewed primarily as 2D.
3D – Sculpture: Includes pottery, sculpture, jewelry, miniatures, 3D mixed media and any other dimensional crafts that do not fall under the category 'Sewing and Fiber Arts'.
3D – Sewing and Fiber Arts: Knitting, crocheting, felting, etc. Also includes all sewing, quilting and most wearable art. (Mixed media in which fiber and/or fabric are the primary component should be entered here.)
Please note: the Visual Arts Committee may, at their discretion, change the category of an entry or reject an entry that does not fit the spirit of the contest.

Instagram Takeover Continues

Hosts of the NAMA Instagram account continue to contribute a wide variety of unique mycospectives from diverse backgrounds and practices. From scientists and educators to cultivators, chefs, photographers, filmmakers and more, our Instagram channel has something new each week!

Please check out the account @northamericanmyco. Takeover hosts span North America, with Mexico, Canada, and the U.S. represented.

A huge shout-out to all of the hosts listed below. Thanks to your passion, we now have more than 16,000,000 followers!

Ezequiel Cruz	@_fungaria_
Eleana Hsu & Kevin Gondo	@sharedcultures
Fresh From the Farm Fungi	@freshfromthefarmfungi
Symbiosis Viva La Funga	@symbiosis_mx
Andrés Better	@andybetterbugs
Zachary Mazi	@thefungivore
Zach Kiser	@mushroomcultpro
Sidnee Obersingleton	@morchellaphile
Alison Pollack	@marin_mushrooms

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Sidnee Obersingleton	@morchellaphile
Alison Pollack	@marin_mushrooms

Myco Calendar

Regional and Continental Events

September

8 to 11
Northwestern Wisconsin MycoEnthusiasts
Baronett Tri County Foray
Baronett, WI
www.facebook.com/BarronettTCF

15 to 18: Northwoods Regional Foray
Lakewoods Resort & Lodge, Cable, WI
Hosted by the Wisconsin Mycological Society and NAMA. Information at namyco.org/regional_foray

16 to 19
Le Cercle des Mycologues de Montreal
FQGM-NEMF foray
Joliette, Québec
www.mycomontreal.qc.ca

24: 22nd Annual Gary Lincoff Foray
North Park, Pittsburgh, PA
Hosted by the Western Pennsylvania Mushroom Club, with guest mycologists Alan and Arleen Bessette.
wpamushroomclub.org/lincoff-foray.

23 to 25
Foray Newfoundland and Labrador
Foray 2022
Max Simms Lion's Camp @ Bishops Falls
www.Nlmushrooms.ca

23 to 25
South Sound Mushroom Club
Annual Fall Wynoochee Foray
Wynochee Lake, WA
www.southsoundmushroomclub.com

24
Western Pennsylvania Mushroom Club
22nd Annual Gary Lincoff Foray
Pittsburgh, PA
www.wpamushroomclub.org

Sept. 29–Oct. 2 NAMA Annual Foray
Trout Lodge, near Potosi, MO
Lectures from renowned mycologists, numerous forays, cooking demonstrations and more.
namyco.org/annual_foray

October

2 to 5
Alberta Mycological Society
GAMF (Great Alberta Mushroom Foray)
Alberta TBD
www.albertamushrooms.ca

8–9 Alabama Mushroom Festival
Lake Howard, Sylacauga, AL
The Alabama Mushroom Society launches a new annual festival featuring speakers such as Britt Bunyard, Alan and Arleen Bessette, Jay Justice, Alan Rockefeller, Bill Yule, and more, as well as forays, vendors and crafts. alabamamushroomsociety.org/AMF

15
Nova Scotia Mycological Foray
Big Fall Foray
Canning, NS
www.nsmycologicalsociety.org

23
Snohomish County Wild Mushroom Society
Wild Mushroom Show
Everett, WA
www.scmsfungi.org

29 to 31
North Texas Mycological Association
Halloween Foray
Denton, TX
https://northtexasmycology.org/

15 to 16
Ohio Mushroom Association
Fall Foray
Stark County OH
www.ohiomushroomsociety.wordpress.com

November

4 to 6
Oregon Mycological Society
2022 OMS Fall Mycology Camp
Rockaway Beach, OR
www.wildmushrooms.org

5 to 6
Wild Rivers Mushroom Festival
Annual Festival
Brookings, OR
www.wildriversmushroomfestival.com

Cover Art: *Matsutak*, Watercolor on Paper by Denis Benjamiin